

anti-corrosion times

Reporting on industry news, noteworthy applications and new developments of the fusion bonded coating system for corrosion prevention.

Published by CRSI — Epoxy Coating Committees

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CRSI President W. Dale Brougher and FBCA President H. Blair Trimble seal agreement.

Epoxy-Coated Rebar Industry Aligns With CRSI

Alliance Exemplifies CRSI's 60 Year Search for Excellence in Concrete Construction

When the Fusion Bonded Coaters Association (FBCA) emerged from "nowhere" in 1977, the scope of that fledgling organization's "modus operandi" was envisioned as without bounds — so versatile is the fusion bonded powder coating process. It was apparent that use of the process extended to applications beyond the construction industry, or protection of steel imbedded in concrete, per se.

Limited funds forced concentration of marketing efforts on areas where the need was most critical — corrosion prevention of steel reinforcement in concrete structures; i.e., bridge decks, parking garages, waste water treatment plants, marine installations, etc. Prime impetus for FBCA's selection of this specialized approach came from the Federal Highway Administration, who developed and validated the epoxy coating system of corrosion prevention, then rapidly implemented its use across the nation to resolve bridge deck problems of near catastrophic proportions.

And, so it was. Today, the benefits of epoxy-coating transcend many different industries and a myriad of applications.

continued on page 2

Award-Winning Concrete Bridge



All Decked Out With Epoxy-Coated Rebar



This slender haunched reinforced concrete bridge represents a unique integration of structural and architectural design. In the words of the judges,* who distinguished the Wornall Road bridge in Kansas City, Missouri with a 1983 CRSI Design Award, "A nice transition from the real world into the fantasy."

Designed by Howard Needles Tommen Bergendoff, it posed a special challenge. First, it had to complement the Spanish architecture of a world-famous shopping district, which it adjoins. Second, it had to withstand occasional flood conditions, such as devastated an earlier arch bridge which acted as a dam when debris became jammed under the bridge.

This striking new structure, with three spans totalling 133 feet, a 62 foot roadway

and two 14 foot sidewalks, has a channel opening nearly double that of the original bridge. Use of a slender haunched reinforced concrete slab minimized structure depth, allowing enlargement of the channel opening vertically. The slender piers, which parallel the creek at the edges of the channel, increased the opening horizontally.

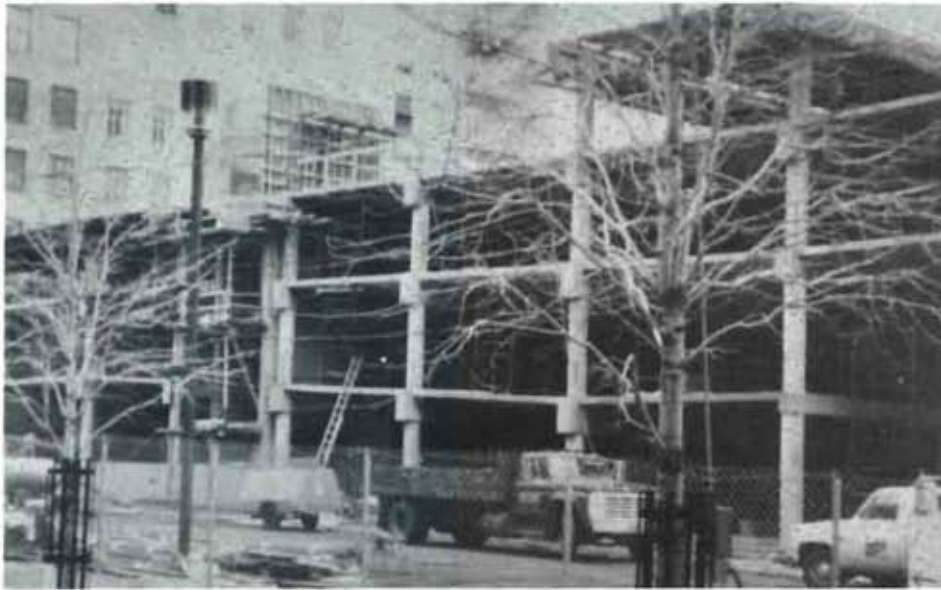
Taking no chances for future corrosion problems, the engineers specified epoxy-coating for the grade 60 reinforcing steel in the bridge slab, which was cast in place.

*1983 CRSI Design Award Jury:

Chairman, Robert Broshar, FAIA, President, The American Institute of Architects, Washington, D.C., Thomas W. Ventulett III, FAIA, Partner, Thompson, Ventulett, Stainback & Associates, Inc., Atlanta, Georgia, Boyd C. Ringo, Professor of Civil Engineering, University of Cincinnati, Cincinnati, Ohio

City says:

“Design This Parking Garage For Absolute Lowest Maintenance!”



Reinforced concrete with epoxy-coated rebar helps supply answer.

Rockford, Illinois, situated in the far northwest corner of the state, has rugged winters — and hot, hot summers. Tough conditions for any structure.

When Rockford's Metro-Center Authority commissioned the architectural firm of Larson & Darby and the project consultants, Hanson Engineers, Inc. to plan a new public parking structure with first floor commercial space, it demanded a facility that reflected the latest state of the art. It had to be designed and built so that future maintenance would be at the lowest possible level.

The A/E team gave Rockford what it wanted to thwart its rugged, freeze-thaw winters and sweltering summers: a reinforced concrete 5 level, 102,300 square foot garage with 300 car capacity. Here's what delivers such promise:

- All Grade 60 reinforcing steel, from the ground up is epoxy-coated. Corrosion will never get a chance to do its costly damage, even though it will be subjected to year-after-year attack from de-icing salts.
- All precast architectural panels have reinforcing steel epoxy-coated for corrosion protection.
- The structure is designed for positive, effective drainage to prevent ponding.
- A dense, high quality concrete was specified to minimize concrete cracking.
- The post-tensioning of the concrete decks and beams will reduce concrete tensile stresses and associated cracking.
- Finally, a liquid sealant is applied as further protection.

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continued from page 1

By 1984, the fusion bonded coating industry's scope became well defined. It had become totally oriented to the business of epoxy coating reinforcing steel. Its sole mission — to provide corrosion protection for reinforcing steel and related steel embedments in concrete, and thereby avert untimely deterioration of all concrete structures subjected to chloride contamination.

FBCA, from its embryo state, became a recognized trade association. The association helped the industry grow in constructive and orderly fashion during formative years. This fact stands as a tribute to supporting members of FBCA over a 7-year period.

However, executives of FBCA and Concrete Reinforcing Steel Institute (CRSI) decided that it was now time to identify the industry for what it is — i.e., “the Epoxy-Coated Reinforcing Steel Industry.” In effect, the product is simply a new grade of reinforcing steel, serving a special purpose — one that enhances the quality of concrete construction.

It was apparent that CRSI, with its infinitely greater “know how” and technical resources, should assume direct responsibility for the product's continued healthful growth and proper application. This it will do, principally, through three newly established committees; i.e., the Epoxy Coating Advisory, Marketing and Technical Committees. “The show is the same — only the stage has changed.”

H. Blair Trimble (Steel Service Co., Knoxville, TN) is Chairman of the epoxy-coating advisory committee, Brad J. McFadden (Epoxycote Rebar, Inc., Stony Creek, Ontario) Vice Chairman. Robert T. Stafford, who provided management services for FBCA, serves the new epoxy-coating interests of CRSI as Director of the Epoxy Coating Committees.



Paper Mill Cleans Up After Itself

Paper making is a thirsty business. It requires huge amounts of water. So, it has to be careful not to pollute its water source.

Here's a good neighbor newsprint mill that's taking no chances. It's the Trois-Rivieres newsprint paper mill in Quebec, owned by CIP, Inc., Montreal, Canada. To provide state-of-the-art treatment for its affluent, a new 210' diameter clarifier is being constructed.

This will treat all wastewater, removing

sedimentation through its settling basin and reusing much of the water. Water discharged back into the stream will not harm fish life.

The huge tank is constructed of reinforced concrete with epoxy-coated grade 60 rebar to protect against the corrosive chemicals in the process water. Walls are 14' at the outer edge. The conical slab slopes to a 28' depth at the center. F. M. Kraus & Associates, Montreal, are the engineers.

Dam Site Smart Solution



Epoxy-coated rebars used as anchorage system in river locks.

Six miles downstream from Pittsburgh on the Ohio River are the Emsworth locks and dam. It finally came time for the U.S. Army Corps of Engineers to restore the old locks as part of an on-going major rehabilitation program.

To improve the stability of the 50' high gravity type, unreinforced concrete lock walls, which was marginal when the lock chambers were dewatered, it was decided to install an anchor system into the rock below the concrete structure. To provide the desired degree of stability, twenty-five middle and river wall anchors were set.



Structural engineer on the project, Anton Krysa, of the Pittsburgh Army Corp District, reported the job was successfully completed by drilling anchor holes and inserting bundled epoxy-coated rebars. These had specially fabricated centralizers to center the bars within the anchor holes and protect the epoxy-coating during lowering. After the bundled bars were inserted by a crane-mounted barge, the holes were grouted. The epoxy coating was required to protect the steel rebar from the corrosive coal seam through which the anchors had to pass.

Approximately 115,000 pounds of epoxy-coated rebar were installed to put the old Emsworth locks on a solid footing. Smart work, U.S. Army Corp of Engineers!

Drilling holes on middle wall of lock wall. Specially fabricated centralizers centered bundled bars in anchor hole.

O'Hare Hilton Parking Apron Combats Deicing Salts With Epoxy-Coated Rebars



It's been said that more people pass through Chicago's O'Hare International Airport in one year than live in Spain.

Well, O'Hare is now in the process of getting still bigger in preparation for even more passenger volume in the future. This includes a new international terminal.

In preparation for this major expansion, the present parking garage adjacent to the terminals and the O'Hare Hilton Hotel is giving up its first-floor parking level for use as a temporary terminal. This meant a new roadway for buses to travel from the terminal across from the Hilton to a remote plane parking area.

The walkway in front of the hotel was disrupted to accommodate additional parking in an otherwise congested area. The wide concrete slab was 100% reinforced with epoxy-coated rebar to avert premature deterioration from deicing salts deposited by standing vehicles.

Engineers for the Chicago O'Hare International Airport Development Program are O'Hare Associates, Chicago, IL. Contractor for this project is Peabody Midwest Construction Co., Des Plaines, IL.

Parking Garage Restoration:

How the experts do it.

The Genesee Plaza Hotel Garage, Rochester, New York, was seriously deteriorated after only 14 years. Reason: corrosion of imbedded steel, hastened by the use of deicing salts.

Sear-Brown Associates, P.C., Rochester, was called on as engineering experts in restoration of parking structures to put new life in this essential facility.

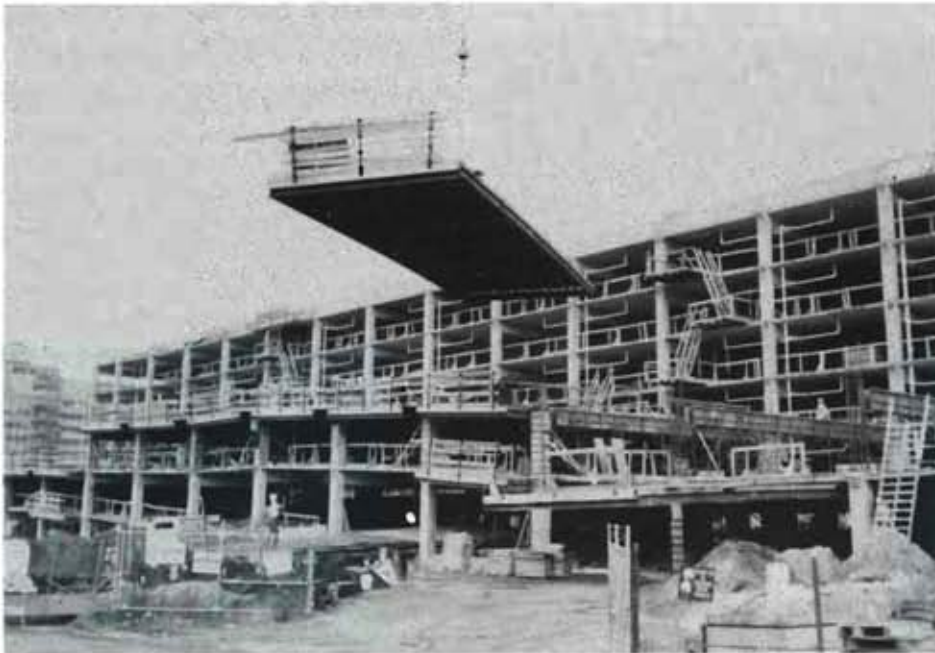
As part of SBA's recommendations, over 28 tons of new rebar were installed by Crane-Hogan Structural Systems, Inc. All were epoxy-coated for extra protec-



tion from air and moisture, should the penetration of chloride ions break down the protective environment normally afforded by the new concrete.

Reinforcement left in place during the removal of unsound concrete was coated in place with epoxy. With these measures, the Genesee Plaza Hotel will go on serving guests for a long time.

While the restoration project for this four level, 425 car garage was bid at over \$1,000,000. — the value of epoxy-coated rebar amounted to slightly more than 1%. A smart investment.



Famous Clinic Insures Garage Health

The Cleveland Clinic Foundation is noted for its leadership in progressive medicine and health programs. It's one reason this already large institution continues to grow. So much, in fact, it was outgrowing its parking facilities.

New plans were drawn up for a \$10,000,000, seven level parking structure for 1,500 cars. Ceasar Pelli & Associates, New Haven, CT, architects and Barber & Hoffman, Inc., Cleveland engineers, teamed up with construction manager,



Assembling beam cage for clinic parking structure. Note flying form in photo above, a mark of an efficient job.

Gilbane Building Company/Burks Electric Corp., a Cleveland joint venture to put the big project on a tight schedule.

The structure utilizes epoxy-coated grade 60 reinforcing steel in all top steel in decks and beams. Anchor plates for post-tensioned tendons are epoxy-coated, as well. Spans are 60' long, bays 24' wide. Of the 826 tons of rebar used in the structure, 27% were epoxy-coated. The corrosion protective coating increased the total cost of rebars in the structure by less than 10% and amounted to about 4 tenths of 1% of the entire project cost. Interestingly, the structural engineer on the job commented "We would not consider, today, doing a structure like this without using epoxy-coated rebars".

Author! Author!

Details and photos of your interesting reinforced concrete structures using epoxy-coated rebar are welcomed. If used, your report will be seen by over 10,000 engineers, contractors, owners and public works officials.

Torture Chamber



Geothermal plant solves muffler blowouts with epoxy-coated R/C chamber.

Near Geyserville, California, Pacific Gas and Electric (a public utility) and other developers are harnessing nature to produce low-cost energy.

Here, several geothermal generating plants are tapping the steam produced by this large underground energy source to generate nearly 2,000 MW of electrical power.

Cruel Application

To muffle the thunderous 120 decibel sound of rushing steam during start-up and shut-downs, these generating stations used fabricated steel for the large 15' diameter and 21' tall mufflers containing noise attenuation material. Because of the 350° F elevated temperature, vibration and the corrosive nature of the steam, portions of the steel chambers have been deteriorating and causing a loss of noise attenuation properties.

Reinforced Concrete Specified

The engineers, Veizades and Associates (San Francisco), in conjunction with the resource developers, GEO Operator Corporation (Santa Rosa), agreed that to provide maximum life span for these pressure chambers, reinforced concrete with epoxy-coated rebar was the answer. So constructed, the new muffler cylinder is expected to withstand the exceptionally severe impact and corrosive conditions of this unique application where temperature goes from 16° F on the outside of the concrete to 350° F on the inside.

OOPS . . .

The last issue of Anti-Corrosion Times reported that 1,540 tons of epoxy-coated reinforcing steel were used in the Wisconsin 32-mile interstate 90/94 project. Not 1,540. Actually, it was ten times that amount — 15,400 tons! All epoxy-coated. Sorry, Wisconsin DOT. *Editor.*

. . . LOOPS

Epoxy-coated steel is not always rebars!

Many more products are being given this inexpensive, easily applied protection. Like these vertical loops, which are part of the encasement for the prestressed tendons in the Sunshine Skyway Bridge, Tampa, Florida.

